EARLY HISTORY

of the

BALTIMORE AND OHIO RAILROAD COMPANY

by

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Paper Presented

for

Admission to the

Phi Mu Honorary Engineering Fraternity

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-:- SUMMARY -:-

This paper treats of the early engineering history of the Baltimore and Ohio Railroad, the first railroad in America. It takes up the inception of the project; gives an account of the promoters and early engineers; treats of the original surveys and location of the line; discusses the engineering and construction methods and difficulties involved; and includes some of the available items of original cost.

INCEPTION OF PROJECT

A matter of great importance to the City of Baltimore about 1826 was the prospect of losing its share of the trade of the Ohio and Mississippi valleys. This fear was inspired by the development of roads and canals in the states of New York and Pennsylvania.

It had been hoped that by constructing the proposed Chesapeake and Ohio Canal this trade could be recovered, but the report on this project made in July 1826 showed its impracticability due to the great cost entailed and scarcity of water to maintain the canal in operation.

Philip E. Thomas, President of the Mechanics Bank of Baltimore, and George Brown, son of one of the Directors of the same bank, became interested in this matter and called a meeting of prominent men of Baltimore "to take into consideration the best means of restoring to the City of Baltimore that portion of the Western trade which has lately been diverted from it by the introduction of steam navigation and by other causes." This meeting took place on February 12,1827 at Mr. Brown's residence and was attended by the following men:

Charles Carroll of Carrollton
William Patterson, Chairman.
Isaac McKim
Robert Oliver
Charles Ridgely of Hampton
Thomas Tenant
Alexander Brown
John McKim, Jr.
Talbot Jones
James Willson
Thomas Ellicott
George Hoffman
William Steuart
Philip E. Thomas
William Lorman
George Warner
Benjamin C. Howard
Solomon Etting
W. W. Taylor
Alexander Fridge
James L. Hawkins
John B. Morris
Luke Tierman
Alexander McDonald
Solomon Birckhead
David Winchester, Secretary

The available data was placed in the hands of a committee composed of:

Philip E. Thomas, Chairman	Joseph W. Patterson
Benjamin C. Howard	Evan Thomas
George Brown	John V. L. McMahon
Talbot Jones	

On February 19 this committee reported favorably for the immediate construction of a railroad.

INCORPORATION AND FINANCING

The charter of incorporation was drawn by Mr. John V. L. McMahon, a Baltimore lawyer, and this is yet the actual charter of the company. It was the first legal instrument of this kind written in America, and is remarkable for the foresight used to provide for the future development of the company.

The General Assembly of Maryland passed on February 28, 1827 a special act of incorporation to the "Baltimore and Ohio Railroad Co." with a capital stock of $5,000,000. for the transportation of passengers and freight. The company is still operating under this charter, which provides for exemption of taxation in Maryland.

Philip E. Thomas was elected first president of the Company and George Brown first treasurer. Three million dollars worth of stock was offered and was over subscribed by April 24, 1827. The State of Maryland subscribed to 5,000 shares of stock and later subscribed for a larger amount.

The rapid sequence of all these important acts gives an idea of the enthusiasm which predominated in the community for this great enterprise.

TRAFFIC CONSIDERATIONS

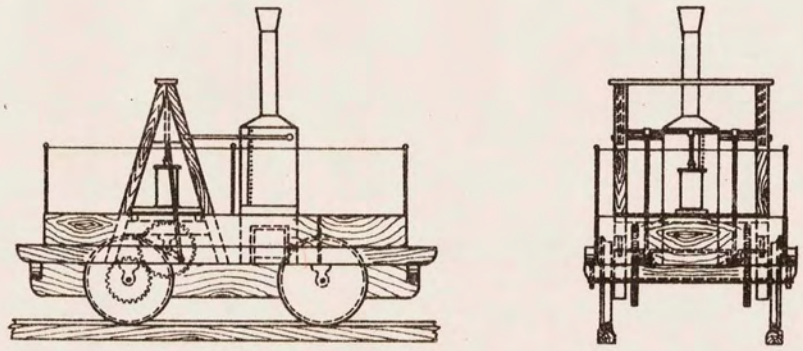
The ultimate purpose of the company was to build a railroad from the City of Baltimore to the banks of the Ohio River. From printed accounts of that period it can be inferred that the mind of the promoters was to use animal power, so that calculations were made on the power of average good horses. However, after the success of Peter Cooper's "Tom Thumb" locomotive, steam power was considered. With a speed of ten miles per hour, it was thought that the trip from Baltimore to the Ohio River could be made in thirty-six hours. Fig.- 1

EARLY DIFFICULTIES

When construction commenced difficulties, physical, financial, and legal, were encountered by the company. The physical difficulties were in the form of narrow valleys, hard rock, deep ravines, and the Allegany Mountains. The financial difficulties were encountered later, during a period not included in this brief account, and were successfully overcome. The legal difficulty was mainly with the Chesapeake and Ohio Canal Company on account of rights-of-way. This delayed construction until the General Assembly of Maryland on March 22, 1833 passed an act to remedy this condition. The Baltimore and Ohio Railroad Company paid to the Canal Company $266,000 for land and for damages.

THE GENERAL LOCATION

Tanner in his work on the "Canals and Railroads in the United States", printed in 1840, says regarding the general location of the line beyond Harper's Ferry, "the



SKETCH OF
COOPER'S "TOM THUMB" LOCOMOTIVE
FIRST TRIED ON B. & O. AUG. 25, 1830

1-31-23 P.B.M.

Characteristics: Single working cylinder, $3\frac{1}{2}$" diameter.
Wheels, 30" diameter. – Speed, 18 miles per hour.

Fig. - 1

extension of the Baltimore and Ohio Railroad to the Ohio River has been located, and a part of the road is now in progress. The line on leaving Harper's Ferry, to which point the road is completed, ascends the west bank of the Potomac to Opequan Creek, where it turns towards the south-west, and, following the valley of that creek, enters Martinsburg, in Berkeley County. Thence by a nearly direct and north-west course the line is conducted over the ridges of Berkeley and Morgan Counties, and crosses the Potomac into Maryland. After crossing the Potomac, it turns abruptly and pursues a south-west course along the north declivity of the Potomac to the mouth of Town Creek in Allegany County; and thence curving towards the north-west, proceeds by the river bank, to the town of Cumberland. Here the road leaves the Potomac, and at a distance of seven miles, passes into Pennsylvania, and descends the valley of the Casselman's River, whose southern bank is followed to its discharge into the Youghiogeny, thence through gaps in Sugarloaf Mountain and Laurel Hill, in Fayette County, and running near Uniontown, it enters and pursues the valley of Redstone Creek to Brownsville, on the Monongahela. From Brownsville, its course is nearly direct, through Washington County, until it reaches the western boundary of Pennsylvania and re-enters Virginia, when it descends the valley of Wheeling Creek, and finally terminates at the town of Wheeling, on the Ohio River. The entire length of the line from Harper's Ferry to Wheeling is about 200 miles, and 280.50 from Baltimore."

GENERAL ENGINEERING PROBLEMS

The Board of Engineers organized to consider the problems of surveying and construction was selected on April 12, 1828. It was composed of Philip E. Thomas, President of the Company, Colonel S. H. Long, and Jonathan Knight, Engineers.

This Board of Engineers was really doing pioneer work in railroad construction; they did not have topographical maps to show the character and features of the terrain, nor text books on railroad location; neither were there similar works which could be studied. A reconnoissance of the proposed route was made mostly on foot. In the accompanying sketch, the routes surveyed are shown. Fig.- 2

INSTRUMENTS USED

No original information is available about the instruments used on the survey and location of the first section. It is supposed that the open sight compass was used for line and the spirit level for grade. The first American transit, invented by Young in 1831, was used later to locate the line from Harper's Ferry to Wheeling.

In the selection of grades, plain common sense was used. Since horse-power was to be employed and it was estimated that the volume of freight would be in the ratio of 1 outgoing from Baltimore to 5 incoming from the Ohio Valley, the engineers tried to equate, so to speak, these conditions so as to arrive at a grade which would nearly require the same expenditure of power for hauling one ton of freight upgrade as five tons down grade.

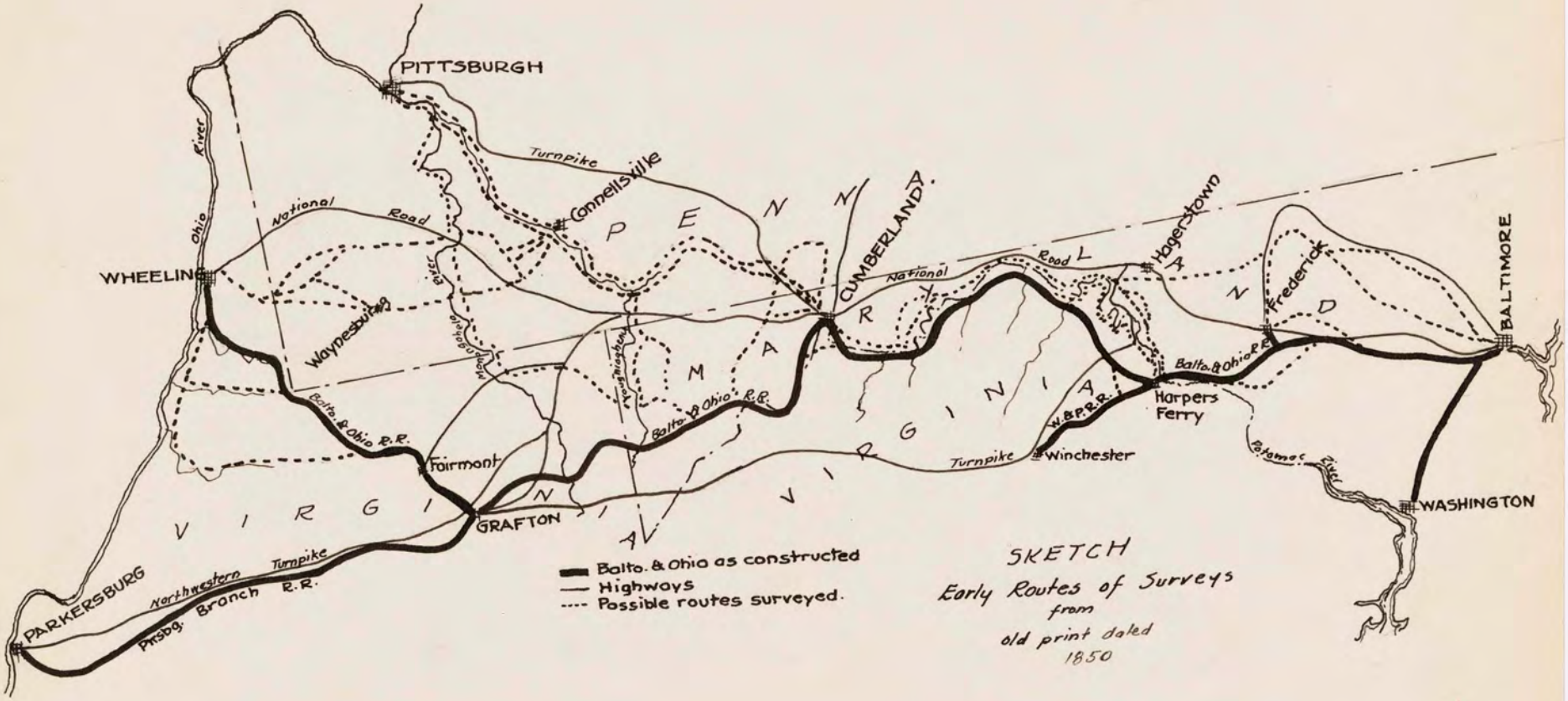

PITTSBURGH
Ohio River
Turnpike
Connellsville
National Road
WHEELING
Waynesburg
Cumberland
Hagerstown
Frederick
BALTIMORE
Balto. & Ohio R.R.
Fairmont
GRAFTON
Harpers Ferry
W. & P. R.R.
Winchester
Turnpike
Potomac River
WASHINGTON
PARKERSBURG
Northwestern Turnpike
Prsbg. Branch R.R.
Balto. & Ohio as constructed
Highways
Possible routes surveyed.
SKETCH
Early Routes of Surveys
from
old print dated
1850

Fig. - 2

The work done by a horse on a level railroad was computed to be 8.75 tons, at 2 miles per hour for 10 hours a day. The grade at which the component of gravity along the incline would equal the friction for 4' diameter wheels was estimated at 30' in one mile, or 0.56 of 1%. With this grade, it was estimated that two horses would be required to pull the load. A grade of 13' to the mile, in view of this calculation, was decided as necessary; this grade was expected to require equal pull for traffic in both directions for loads in the ratio of 1 to 5. However, as will appear later, in the construction all grades below 30' per mile were considered level grades.

RESOURCES OF COUNTRY FOR CONSTRUCTION

At the beginning it was thought that the terrain was not of a character which would make expensive roadway construction. The soil was apparently argillaceous and adhesive, over a substratum of sand, gravel and pebbles, which would form a good road bed.

Timber for sleepers and rails was available except in the vicinity of Baltimore, where stone was abundant.

A few wooden bridges were necessary; the timber for this purpose being available at the rate of $8. per thousand feet board measure.

Stone rails of good quality were available at 8¢ per linear foot; yellow pine rails at 3¢ per linear foot, Locust sleepers at about 25¢ each and white or red oak sleepers were much cheaper.

Limestone prevails between Harper's Ferry and Williamsport. The Smith Mountain gives very good sandstone. Material for masonry work was plentiful and good over the entire line.

Numerous culverts and viaducts were found necessary in the section between Baltimore and Ellicott's Mills, and the material had to be hauled, the distance varying from one to three miles. Inexperienced labor and lack of machinery made the work expensive.

The quarry used for about five miles of this section was the property of Richard Caton, Esquire, and he gave free use of it to the company.

The timber was bought at wholesale market prices and brought down by water.

George Brown did commendable work in devising economical methods of construction.

In the report of the President and Directors of the company for the year 1829, the excess of actual cost over estimated cost was attributed to the following causes:

1 - Difficulty in securing good stone for masonry in the first fifteen sections. (Sections were about three-quarters of a mile.)

2 - Increased cost of labor.

3 - Hard rock beds not apparent in the surface. (This shows the lack of knowledge of local geological conditions).

4 - Substitution of stone for timber in structures.

Following are the engineering principles under which operations were carried on:

1 - Adjustment of road bed grade in a manner adapted to the traffic; this was discussed above.

2 - Location of curves. Since engineering books did not contain any method for laying out curves, the Board of Engineers engaged itself in devising a method of easy application for the laying out of the serpentine route which was to follow river banks. Two methods were devised:

(a) one based on a series of equal chords and corresponding ordinates at equal divisions of the chords, and the relations of tangents to the arcs of these chords. Some algebraic formulae and diagrams are referred to in document K, which accompanied the original report of the Board of Engineers, but this document is missing.

(b) the second method was based on the relation between chords versed sines and tangents to their arcs. Geometrical illustrations are referred to in another document marked L, which also is missing.

EARLY SPECIFICATIONS

In the location of the line, it was specified that the radius of curvature should be not less than 400 feet, and the maximum deflection at each station should not exceed 14-1/2 degrees, the stations to be 100 feet apart.

Formulae for earthwork computations and width of cuts and embankments were also given in the missing document K, while instructions from the superintendent of construction, paper marked A, also is missing.

Bridges were restricted to 20 foot spans. In some instances, where a greater span was necessary, wooden structures were substituted for stone bridges. The method of construction of bridges was with little variation that used by Burr, noted bridge architect. A bridge exhibit was given

in paper marked N, but this is missing.

The width of track was 4 feet, 6 inches. Each wooden rail was 6 inches square for embankments and 6 inches by 9 inches for bridges, and viaducts. The distance"in the clear" between the two interior rails of the tracks was 3 feet. The length of wooden rails varied from 15 to 60 feet, by increments of 5 feet.

The road bed was made of fragmented stone "weighing no more than four ounces each" (about 3 cubic inches) and this was placed in a layer of 3 or 4 inches and rolled.

Sleepers were 9 feet long and at least 7 inches in diameter; partially imbedded in the stone and placed at intervals corresponding to the length of the rails. The rails were laid on these sleepers, the ends coming together at one sleeper and fitted into notches. The entire lower side of the rail rested on the crushed stone. Besides the sleepers there were ties placed at about 5 feet center to center. (There is doubt about this construction being actually carried out).

The ties were 5-1/2 to 6 feet in length, 5 to 6 inches wide and 2-1/2 to 4 inches thick; "these ties had their extremities formed into dove-tailed tenons, and inserted into mortises in the rails fitted for their reception."

The above construction was adjusted to any curvature and a second layer of broken stone was placed to hold it in position.

Iron plate rails were used with elliptical holes,

large enough to admit 3/8 inch diameter nails. The holes were staggered on either side of the center line and the distance between them, measured on the center line, was "about 10 inches". The holes were countersunk on the upper side. The nails were driven sloping toward the center line. Fig. 3

ORGANIZATION OF ENGINEERING STAFF

1 - Board of Engineers previously named.

2 - Special Commission of Engineers, consisting of J. Knight, Captain William G. McNeill and Lieut. G. W. Whistler, who went to England in November 1828 to study the British railroads.

3 - Topographical Engineers. In charge of management and superintendence of surveys and field operations.

4 - Assistant Engineers. Cooperating with topographicl engineers.

5 - A superintendent of construction appointed by the Board of Directors and in charge of general contracts and construction.

6 - Two location parties, - one headed by Captain McNeill and in charge of the location of the line between Baltimore and Ellicott's Mills, and up to the valley of the Patapsco, and another party headed by Col. Long, in charge from the Patapsco to Wheeling.

CONSTRUCTION

The initial ceremonies for the project were held on July 4, 1828 when the "first stone" was laid at the S.W. boundary of the city, by Charles Carroll, of Carrollton, one of the signers of the Declaration of Independence. Fig.-4 He said on this occasion: "I consider this among the most important acts of my life, second only to my signing the Declaration of Independence, if even it be second to that."

On July 7, 1828 the final location of the line was

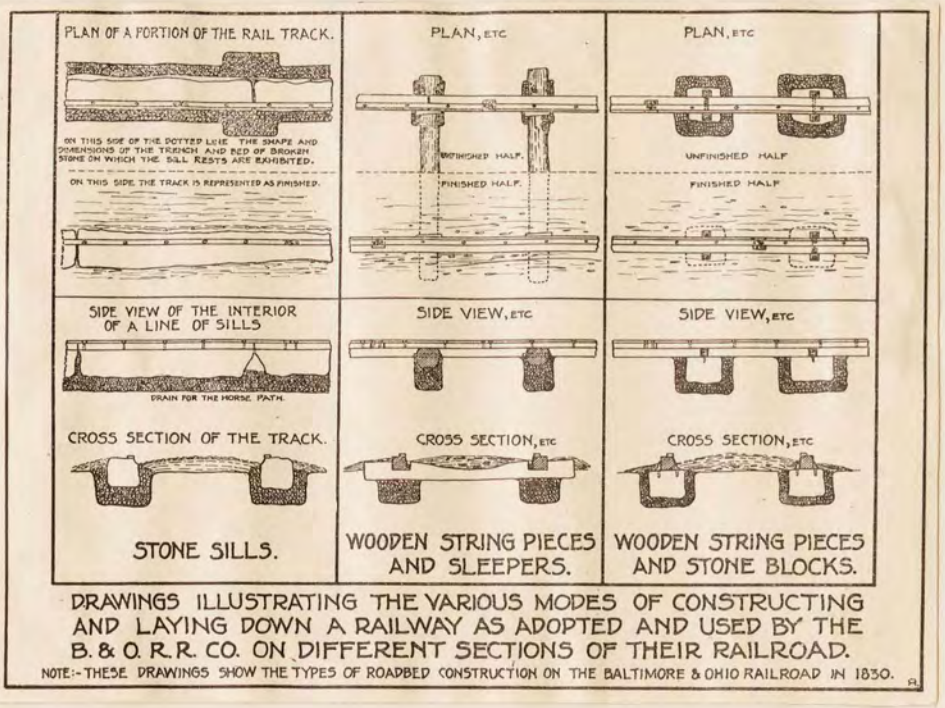

PLAN OF A PORTION OF THE RAIL TRACK.
ON THIS SIDE OF THE POTTED LINE THE SHAPE AND DIMENSIONS OF THE TRENCH AND BED OF BROKEN STONE ON WHICH THE SILL RESTS ARE EXHIBITED.
ON THIS SIDE THE TRACK IS REPRESENTED AS FINISHED.
SIDE VIEW OF THE INTERIOR OF A LINE OF SILLS
DRAIN FOR THE HORSE PATH.
CROSS SECTION OF THE TRACK.
STONE SILLS.
PLAN, ETC
UNFINISHED HALF.
FINISHED HALF.
SIDE VIEW, ETC
CROSS SECTION, ETC
WOODEN STRING PIECES AND SLEEPERS.
PLAN, ETC
UNFINISHED HALF
FINISHED HALF
SIDE VIEW, ETC
CROSS SECTION, ETC
WOODEN STRING PIECES AND STONE BLOCKS.
DRAWINGS ILLUSTRATING THE VARIOUS MODES OF CONSTRUCTING AND LAYING DOWN A RAILWAY AS ADOPTED AND USED BY THE B. & O. R.R. CO. ON DIFFERENT SECTIONS OF THEIR RAILROAD.
NOTE:- THESE DRAWINGS SHOW THE TYPES OF ROADBED CONSTRUCTION ON THE BALTIMORE & OHIO RAILROAD IN 1830.

Fig. - 3


FIRST STONE
of the
BALT. & OHIO RAIL ROAD.

Fig. - 4

commenced at the "first stone" by Lieutenants Cook, Hazzard, and Dillahunty under the direction of Captain McNeill. Announcement was made that proposals for grading and masonry would be received between August 1 and 11, 1828, for the first 12 miles of road. The bids were high as a result of the short time open for proposals and due to the lack of competition.

The company retained as security one-quarter of the relative value of masonry and one-fifth of the relative value of grading until the completion of the contract.

The construction of the first railroad section, that to Ellicott's Mills, was in charge of the party of Major Whistler, superintendent engineer. On this section Thomas McMahon was foreman, and Alfred Ray, Nicholas Ridgely, Silas Ficket and Wendel Bollman were carpenters. It might here be noted that Bollman, then only a boy, later became Master of Road. He designed, among others, the Bollman truss used in the bridge at Harper's Ferry. This truss is still in service, but is now used for highway traffic only. Fig.-5

Beginning at the first stone, the road was kept at the constant elevation of 66 feet above mean tide for the first 7-1/2 miles. This elevation was chosen as the most economical for cuts and embankments, and, also, because it allowed for clearance for an underground crossing for the Frederick Road at Ellicott's Mills. All grades below 30 feet per mile (equivalent to 0.5 of 1%) were considered level grades, and anything beyond was taken as an inclined plane.

Blueprint

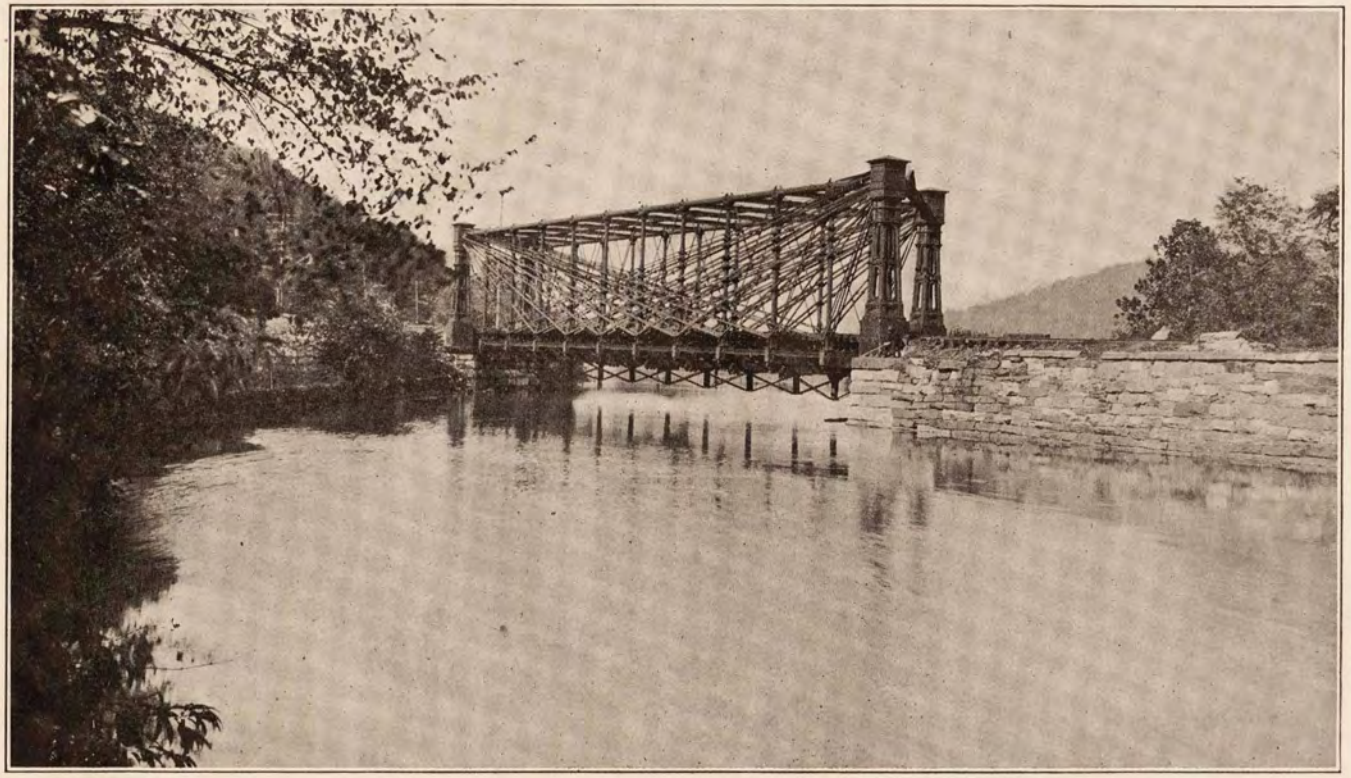
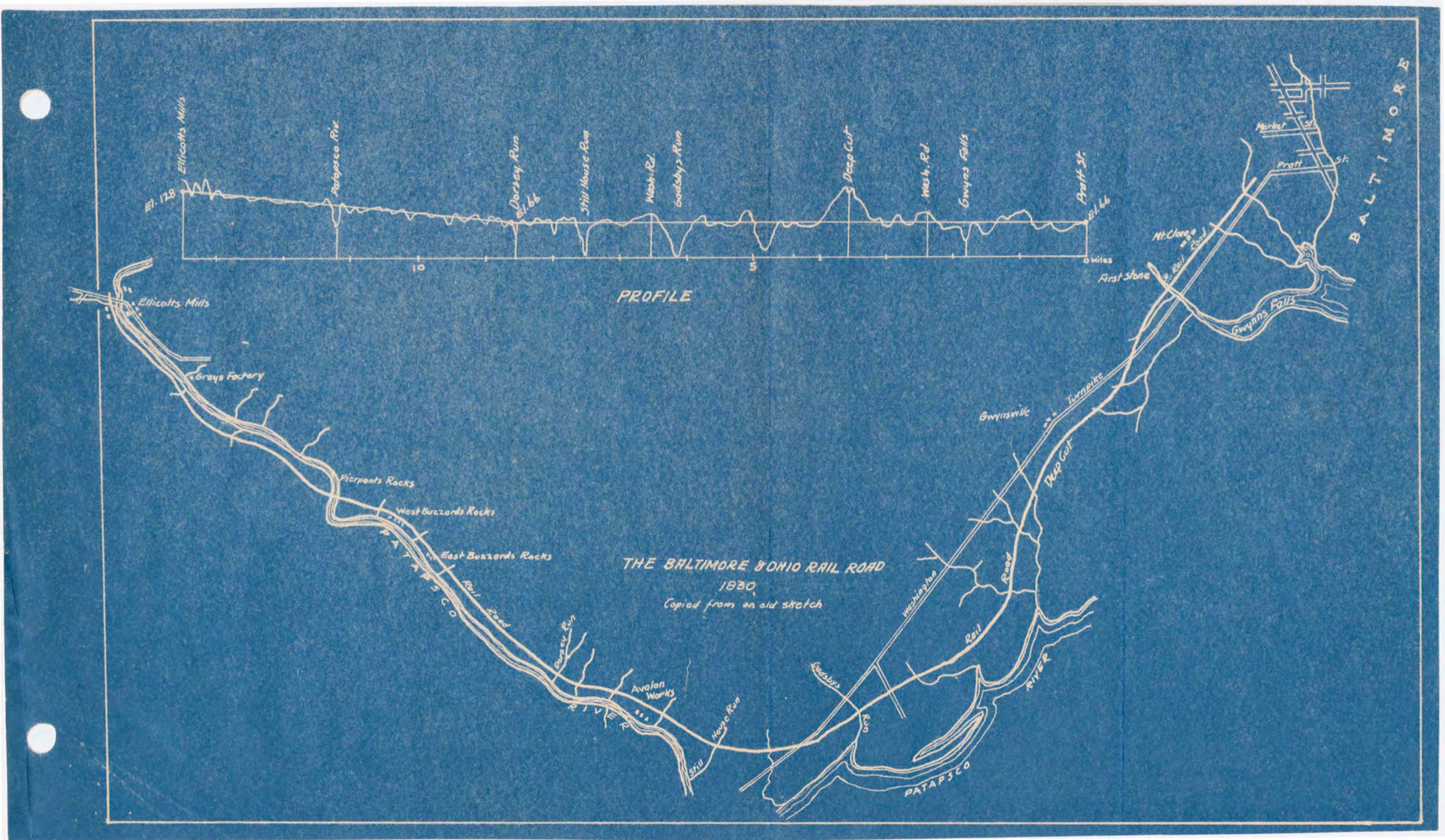


Fig. 20. A Bollman Truss Bridge.

Fig. - 5


Ellicotts Mills
Patapsco Riv.
Dorsey Run
Still House Run
Nash. Rd.
Goadsby's Run
Deep Cut
Wash. Rd.
Gwynns Falls
Pratt St.
El. 128
El. 66
El. 46
10
5
0 Miles
PROFILE
Ellicotts Mills
Grays Factory
Pierponts Rocks
West Buzzards Rocks
East Buzzards Rocks
PATAPSCO
Rail Road
Dorsey Run
Avalon Works
RIVER
Still House Run
Goadsby's Run
Washington
Rail Road
Deep Cut
Gwynnsville
Turnpike
First Stone
Mt. Clare
Rail Road
Market St.
Pratt St.
BALTIMORE
Gwynns Falls
PATAPSCO
RIVER
THE BALTIMORE & OHIO RAIL ROAD
1830
Copied from an old sketch

Iron rails were 15 feet by 2-1/2 inches by 5/8 inches, nailed at about 3/4 inches from the inner edge of the stringer. The projecting corner of the stringer was cut off diagonally so as to allow the flange of the wheel to pass without touching.

The stone sills were about 16 to 20 inches long, about 12 inches wide and from 8 to 12 inches thick. Holes for nailing the rails were made 3-1/2 inches deep and 5/8 inches in diameter. They were filled with wooden plugs hammered in, where the rail was to go. As in the case of the wooden stringers, after the rail was in place the projecting corner was trimmed off to allow the plungers to pass.

Expansion joints were provided, according to temperature. In the case of the iron rails, which were 15 feet long, one-quarter inch was allowed. Fig.-6

The original gage was 4 feet, 6 inches. However, later, (in 1830) the gage was changed to 4 feet, 8-1/2 inches. The change was made as a result of calculations by Engineer Knight, who found that the larger the gage, the larger the difference in length of the two rails on a curve, and therefore, the greater the sliding of the outside wheel. Also with a gage of 4 feet, 6 inches, the center of gravity of the cars was limited to 6 feet 9 inches above the rails, while with a gage of 4 feet 8-1/2 inches, the center of gravity was located at 7 feet, 3/4 inches above the rails.

Fig. - 6

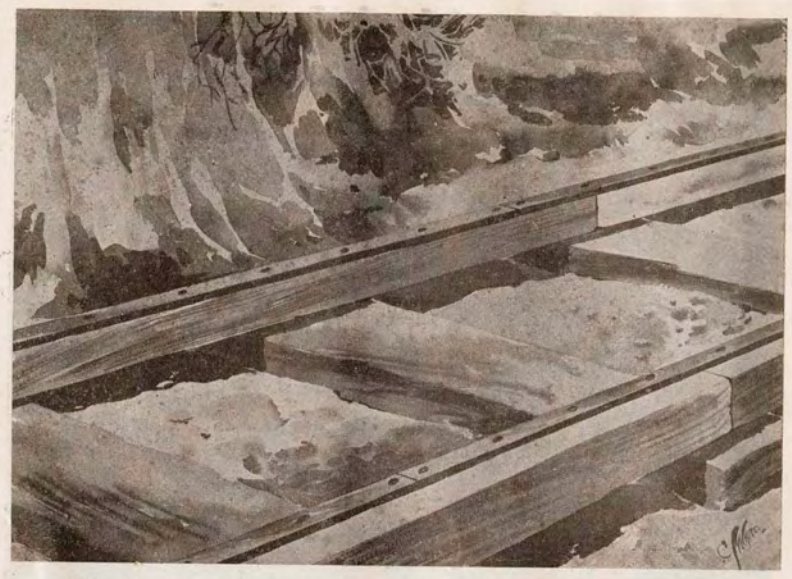


Fig. 7. First Track Laid from Mt. Clare to Vinegar Hill.
Wooden Stringers and Strap Rail—1828-1829.

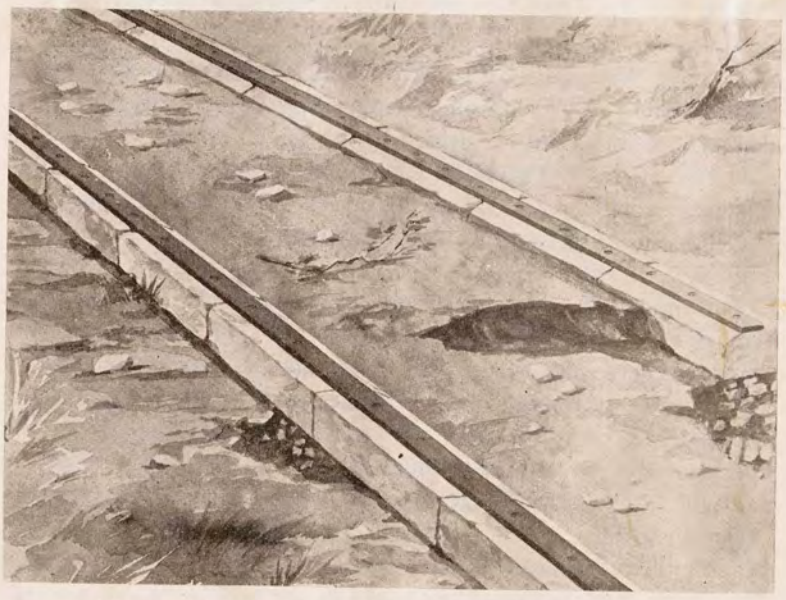


Fig. 8. First Track Laid from Vinegar Hill West.
Stone Stringers and Strap Rail—1829-1834.

CONTRACT PRICES AND COSTS

For stone and iron tracks let at $10.75 to $11.50 per rod of track; the contractor was paid extra for broken stone required over 8.5 perches (212.5 cubic feet).

Including materials, superintendence, and labor, the approximate cost per mile of single track was:

Track with wooden sleepers -	$4,000.
" " stone blocks -	5,000.
" " granite sills -	6,500.
Cost of horse path per mile-	250. - about.

ESTIMATE OF EXPENDITURES DURING FIRST YEAR OF CONSTRUCTION, (SEPTEMBER 1, 1828 to AUGUST 31, 1829.)

Cost of grading and bridging, as per contracts from Baltimore to Dorsey's Run, 7-1/4 miles, at an average of $23,855 per mile	$172,912.
Thence to Ellicott's Mills, as per contract, 4-1/2 miles at $5,610 per mile, inclusive of wooden viaduct across the Patapsco	25,245.
Total.	$198,157.

"COMPARISON ESTIMATED AND ACTUAL COSTS

Estimated cost in 1827	$5,000,000.
Actual cost to 1853	15,600,000.
Total cost, including track, stations, branches and selling stock to 1853. . . .	30,000,000
Estimated length to the Ohio River in 1827 .	290 miles.
Actual length to Wheeling in 1853	379 "
Estimated annual revenues in 1827.	$750,000.
Actual annual revenues in 1852.	$1,325,563.
Actual annual revenues in 1854.	5,645,609. "

CONTRACT DIFFICULTIES

As a result of an error made by the resident engineer on the section of the Patapsco Fork, the contractor, Tuxton Lyon, was able to defraud his men and also the company. He was paid nearly twice as much as the work really performed called for. Upon discovery of this fact, the contractor disappeared, and, therefore, his contract was cancelled. Later it was found that there was a large sum due by the contractor to his men and since the fund thought to be withheld by the company was now imaginary (the contractor having been overpaid) the company tried to appease the workers by offer of part-payment, but they insisted upon having all. Upon refusal by the company they started to destroy the finished track. The men, 135 strong, led by Hugh Reily, overpowered the sheriff, who had a warrant for their arrest, so that it became necessary to call for armed force, and 100 volunteers, led by Brigadier General Steuart, went to the aid of the sheriff and took about 70 prisoners, among whom was Reily, the leader. The damage done was estimated at $6074. The time lost at about 5 to 6 weeks.

Owing to disorders and riots taking place in the labor camps, the contracts let after July 1829 provided that no liquor should be sold or used in the camps.

BRIEF ACCOUNT OF INTERESTING ORIGINAL STRUCTURES

BOLLMAN TRUSS - Reference has already been made to this structure. Fig. - 5

THOMAS VIADUCT - This viaduct, over the Patapsco at Relay, consists of 8 elliptical arches of 58 foot span each. The road bed is 66 feet above the surface of the water. It was designed by B. H. Latrobe and constructed by John McCartney. Construction commenced on July 4, 1833 and was completed on July 4, 1835. Contractor McCartney was so proud of this structure that at his own expense he erected the monument shown in the photograph, which stands near one of the abutments. Figs. - 7 - 8 - 9

CARROLLTON BRIDGE - The original plans for this bridge called for 2 arches of 40 foot span, but to please the owner of a mill, who was afraid that the 40 foot span would dam up the stream, the bridge was lengthened to two arches, one of 80-1/4 foot span and the other 20 foot span.

The structure rises 65 feet from its foundation, is over 300 feet long over all, and contains 10,995 perches of masonry or 274,875 cubic feet. The rise of the arch above the springing is 35 feet. Its construction time was six months. Its entire cost completed was $58,016.73. The estimated cost was $28,500.

PARR'S SUMMIT INCLINED PLANES - On the line between Baltimore and Point of Rocks, is a place called Parr's Summit. Four inclined planes were used to mount this summit. The total length of the planes was 10,250 feet and with the connecting level sections was 18,811 feet. The rise on the eastern side was 179.98 feet and one the western side 240.98 feet. The steepest grade was 1 in 20, or about $2^{o}57'$ and the smallest

Fig.-7

Views of the
Thomas Viaduct,
across the Patapsco
at Relay, Md.
Built in 1833-35
By John. Mc Cartney.
Designed by.
Benj. H. Latrobe

Fig.-8

Photographed by
U. Coronel.

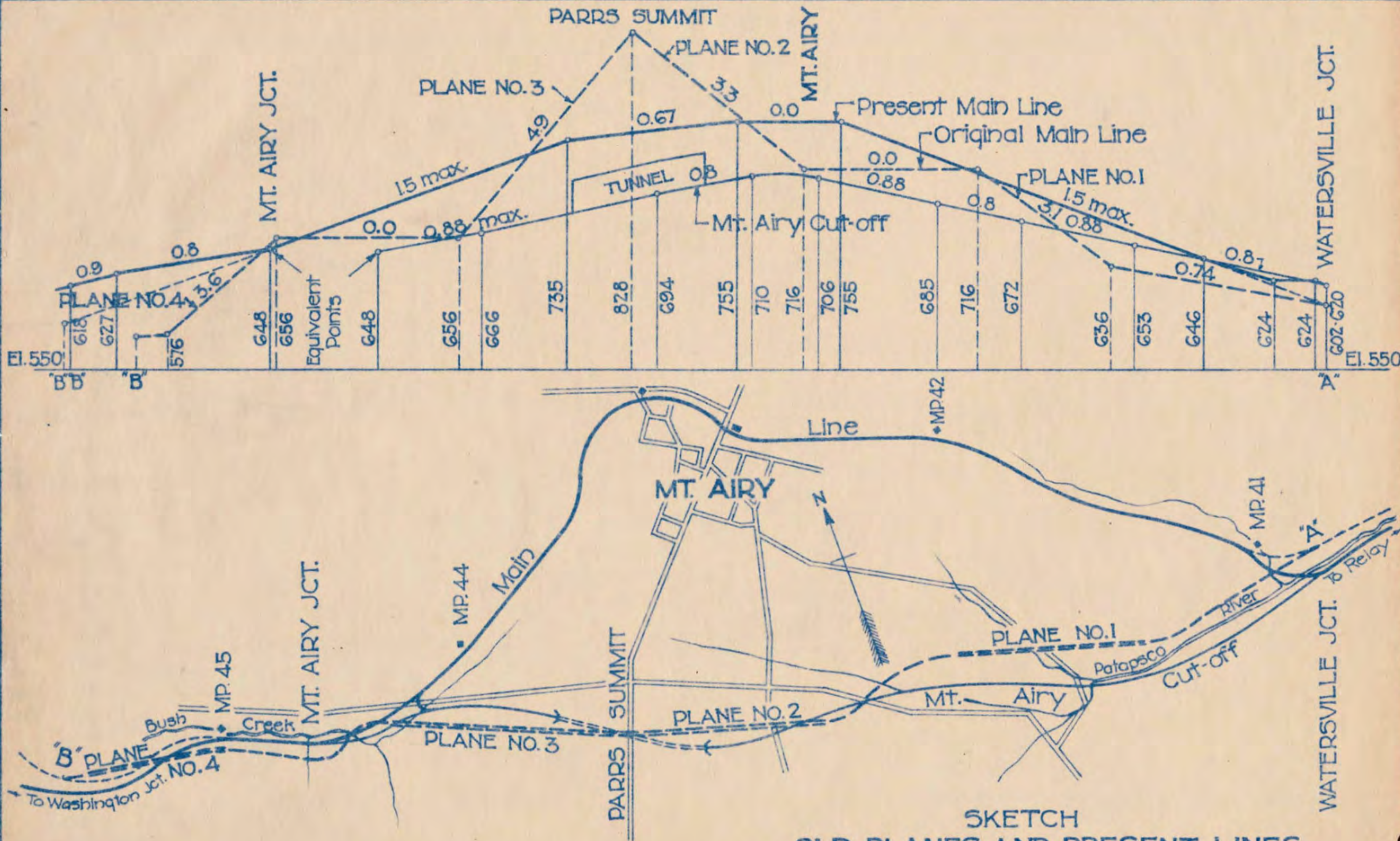
Above. -
Relay Station

Left. -
Monument to the
Thomas Viaduct
Commenced - July - 4 - 1833
Finished - July - 4 - 1835

Erected by
John McCartney,
Constructor.

Fig. - 9

Photographed by
U. Coronel.



SKETCH
OLD PLANES AND PRESENT LINES
MT. AIRY, MD.

3-12-23 P.B.M.

Fig. - 10

1 in 30, or $1^{\circ}55'$, as it was expressed at that time.

A sketch of these planes is given in figure 10

Stationary engines and cable were used to pull up the trains. It was suggested that these engines could be helped by the gravity force generated by a descending train, but since the weight of the trains varied, this system could not be used in practice.

The engines were of 40 H.P. The supply of water was available from a spring which discharged 2300 cubic feet per day. It was expensive to lift this water to the elevation of the engine at the top of the planes. These planes were abandoned in 1838 and a new line was located which shortened the passage of trains by 48 hours.

SOURCES OF INFORMATION

The data for this paper have been collected from the books and documents listed in the following bibliography, as well as from personal inspection.

The writer is indebted to the following gentlemen of the Baltimore and Ohio Railroad for their courtesy in making available their sources of information:
Mr. G. M. Shriver, Senior Vice-President
Mr. R. E. Kennedy, Pilot Engineer of Valuation Department.

BIBLIOGRAPHY AND PLACES WHERE BOOKS MAY BE CONSULTED

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2 - Canals and Railroads of the United States by H. S. Tanner, 1840. Library of Congress.

3 - A History and Description of the B. & O. R. R. by A Citizen of Baltimore, 1853. Pratt Library Baltimore.

4 - Remarks, Propositions and Calculations, Relative to a Railroad and Locomotive Engines to be used upon the same from Baltimore to the Ohio River, by Minus Ward, C. E. April 1827. A pamphlet. Libary of Congress.

The following are books recommended for use by those who desire to continue the study comprising the present paper:

1 - The Economic History of the B. & O. R. R., 1827-1853, by Milton Reizenstein. The Johns Hopkins Press, 1897. Pratt Library Baltimore.

2 - Picturesque B. & O., History and Descriptive, by J. E. Panghorn, Pratt Library, Baltimore.

3 - Pamphlets of the Maryland Historical Society of Baltimore, 1827-1853.

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a.c.